Appendix A: Selection of Design Aircraft

Industry and Regional Air Travel Trends

Both national industry and regional trends suggest an evolution of larger aircraft is possible to communities in Southwest Alaska by the year 2020. Often as aircraft become outdated in terms of size and technology in the lower 48 states, they become available for service in relatively remote areas such as Southwest Alaska. In general, the regional airline industry has seen tremendous growth over the last decade in the United States primarily driven by a strong national economy and low fuel costs. The industry has also seen demand increase for seamless connections between major and regional airlines. As a result of this demand, there is less distinction between regional and major operators, which has resulted in the use of larger aircraft for regional services primarily in the lower 48 states. Further, the Regional Airline Association (RAA) expects aircraft with greater than 40 seats will comprise the bulk of aircraft deliveries in the United States for the next 15 years. RAA predicts that the demand for both the 15–19 seat and 20–39 seat aircraft are expected to decline as operators find larger aircraft more cost efficient. FAA regulations such as Part 121 have increased the operating costs for planes under 20 seats.[27] In fact, RAA indicates regional airlines in an effort to reduce cost and complexity of operations are actually attempting to get rid of aircraft in the 15-19 passenger aircraft (which is a larger-sized aircraft in Southwest Alaska). These airlines will likely try to replace these aircraft with larger ones given the increasing demand and complex regulations, resulting in opportunities for movement to more remote or rural areas.

Specific to Alaska, the *Alaska Aviation System Plan Update* (March 1996) suggests that an evolution of larger capacity aircraft to Alaska is already taking place. According to the System Plan Update, Alaska has seen an increase in aircraft size over the last 15 years. The report indicates the capacities of aircraft have increased from 3-passenger aircraft (e.g., Cessna 180s and 185s) to 5-to-7 passenger aircraft (e.g., Cessna 206s and 207s), and that these aircraft are being replaced by 9-passenger aircraft such as Piper PA-31s. As the Piper PA-31s are no longer manufactured, the System Plan Update predicts even larger aircraft will become available in Alaska.

Design Aircraft

Based on the industry and regional air travel trends in Southwest Alaska, it is realistic to assume that larger-sized aircraft, particularly fewer than 40 passengers, will be available in Southwest Alaska in the future. To determine specific design aircraft, the analysis focused on existing aircraft being flown in Alaska as identified from interviews with air carriers providing scheduled passenger and cargo service. In addition, the aircraft listed in the Yukon-Kuskokwim Delta Transportation Plan were also considered for potential use in Southwest Alaska. A number of characteristics were examined to identify a design aircraft for the following categories: 5 to 7, 9, 19 and 30 passenger seats as well aircraft that may be provide cargo-only service. These features are listed below:

- Passenger capacity (seats);

[27] The Federal Aviation Regulation (FAR) Part 121 regulates the operations of the air carriers and operators that provide air service for hire or compensation. For instance, FAR Part 121 regulates the amount of fuel that must be in reserve to make a trip.

- Cargo capacity (pounds);
- Required runway length and width;
- Airport Reference Code (ARC) designation to determine the required safety area length and width[28];
- Number of engines;
- Market presence of aircraft in the entire nation as well as Alaska specifically.

The design aircraft chosen for Southwest Alaska are listed in Table A-1 with the associated runway lengths. As noted, the required runway length is a function of a number of variables including temperature and elevation, so the listed runway is a typical length required for each aircraft.

Table A-1
Design Aircraft for Southwest Alaska

Aircraft	Passenger Capacity	Cargo Capacity (pounds)[29]	Runway Length (feet)	Runway Width	# of Engines	ARC Designation
Piper PA-32	6	1,000	1,760	60	1	A-I
Cessna 208	9	3,500	2,500	75	1	A-II
Piper PA-31	9 (Over-water Routes)	1,700	4,000	60	2	B-I
Beech 1900	19	6,000	4,000	75	2	B-II
SAAB 340	30	8,555	4,400	75	2	B-II
Boeing 737-200	65	31,445	5,700	100	2	C-III
Boeing 727-100	NA	30,500	6,000	100	3	C-III

The basic aim in narrowing the list to one aircraft for each size category was to minimize the runway and safety area dimensions (translating to fewer capital and maintenance costs for DOT&PF) while maximizing the passenger and cargo capacity. For instance, the Fairchild Metro is a 19-passenger aircraft that currently provides service in Southwest Alaska, but the Beech 1900 was chosen over this aircraft. The Beech 1900 is able to carry more cargo and requires a shorter runway than the Fairchild Metro. Our choice does not determine (or invalidate) the design aircraft for an individual airport master plan (AMP), which must plan for the near-term need based upon airframes in use at the initiation of the AMP. We are reasonably assuming the future air carrier fleet and planning strategically on that basis to anticipate where and when future airport expansions, consolidations, or closures may be warranted.

[28] The FAA Airport Reference Code (ARC) is a classification system used to relate the airport design criteria to the operational and physical characteristics of the aircraft intended to operate at the airport. This two-letter code uses the aircraft approach speed designated by a letter and the aircraft wingspan designated by a number.

[29] The actual cargo capacity of an aircraft can vary a great deal depending on factors such as the length of the trip.

The anticipated availability of aircraft in Southwest Alaska was also a major factor in choosing the design aircraft. The Ayres Loadmaster is able to a carry a significant amount of cargo (9,000 pounds), and only requires a 3,300' runway. However, it is not expected that this aircraft will evolve as an airliner in Southwest Alaska due its relatively new presence in the United States aircraft market.

Beech 1900D, courtesy of Raytheon Corporation

Of special note to both cargo and passenger aircraft in Southwest Alaska is the Cessna 208. In terms of passenger capacity, this aircraft can carry 9 passengers and is able to carry a significant amount of cargo for its size (3,500 pounds with just cargo), but it only requires a 2,500' runway. According to the FAA Aircraft Registry there are 648 of these aircraft in regional service nationwide with 44 in service in Alaska. Federal Express has purchased over 300 specially designed Caravans, but the company recently placed an order for 50 Ayres Loadmasters with the option to purchase 200 more. Given this development, there is potential that more Caravans may move into regional air service. The Federal Express version is obviously designed specifically for freight, so the aircraft has the potential to be used easily for cargo.

As far as cargo service in the Southwest Alaska, many of the airlines offer both cargo and passenger service. Conversations with the airlines revealed that some aircraft could be rearranged depending on the passenger and cargo demand. For instance, if only 3 passengers show up for a flight using a 7-passenger aircraft, the additional seats may be taken out and the airline will use the additional capacity for cargo. Typically, the airlines will fill an aircraft with passengers first, and they will then use any remaining capacity to fulfill cargo demand.

Southwest Alaska also has several airlines that provide cargo-only service. Currently, the cargo air carriers in Southwest Alaska are for the most part using smaller aircraft (e.g., Cessna 207, Beech 1900). Service to regional communities and communities with larger runways is provided with larger aircraft (e.g., Northern Air Cargo's Boeing 727–100). The Boeing 727–100 can carry 30,500 pounds of cargo and has an ARC designation of C–III.

Some general remarks on how the design aircraft compared with other similar aircraft is summarized in Table A-2.

Table A-2
Justification for Design Aircraft in Southwest Alaska

Aircraft	General Comparison to Other Aircraft	Potential Market Presence
Piper PA-32	• Runway length and safety area requirements are similar to others in this size category.	• A number are already in service in Alaska. • PenAir, one of the largest airlines servicing Southwest Alaska has indicated they will be using this aircraft for this size category.
Cessna 208	• Safety area requirements are similar to others in this size category. • Aircraft is able to carry large amount of cargo with one of the shorter runways in this size category.	• There is potential for a significant number of these aircraft given recent actions by FedEx (see more details below). • PenAir, one of the largest airlines servicing Southwest Alaska has indicated they will be using this aircraft for this size category
Piper PA-31	• Twin engines make for a safer aircraft for over-water routes.	• A number are already in service in Alaska.
Beech 1900	• Useful cargo load is greater than other options in this size category. • Required runway is one of the shorter lengths among the other alternatives.	• Significant potential for increased use in Alaska given large amount in regional service. In addition, this aircraft has potential for use as cargo-only aircraft.
SAAB 340	• Runway dimensions are slightly greater for this aircraft than some of the other alternatives in this size category.	• There is significant potential for increased use in Alaska given the large amount in regional service, particularly in comparison to other alternatives in this size category.

Bypass Mail Legislation

This section was added after the draft plan public review in order to account for changes in bypass mail brought about by the enacting of the Rural Service Improvement Act of 2002 (PL 107-206 Section 3002 of August 2, 2002). This review effort additionally served to update the plan's aviation analysis by incorporating the two most recent years of FAA enplanement data into its findings. The analysis found the draft plan's recommendations for aviation improvements to be valid, without exception. A tabular summary of the modeling results is presented in Table A-3.

Recommendations are in terms of "121" (Federal Air regulations part 121) and "135" (Federal Air regulations part 135) routes. Part 121 governs aircraft with ten seats or more, two pilots, and a higher standard of instrumentation, weather reporting, and maintenance. Part 135 governs aircraft with fewer than 10 seats, for which the minimum state standard 3300-foot runway length is designed (and sufficient).

Table A-3 Summary of Aviation Analysis 2000 to 2025

Rte	Villages	Present Service	Present Assessment	2025 Estimate	Recommendations
1	King Salmon Chignik (3 in 1) Perryville Port Heiden	Wkdy - 4 Sat - 3 Sun. - 3	With the new USPS regulations all mail for the three Chigniks, Perryville and Port Heiden would be flown from King Salmon along with the passengers. Port Heiden would no longer be a USPS hub. With Saturday delivery of mail (meets USPS requirements), the present service would handle all but about 1% of the mail.	Expanding the service, still with Cessna 208's by one more flight (7 days) delivers essentially all the passengers and 70% mail assigned to the service. The three runs indicate that there may be two to four extra flights needed in the course of a year.	Clearly a "135" Route - should remain that way under the new postal law. *Chignik Area new airport –3300 x 75* *Perryville – 2467 x 50 to 3300 x 75* *Port Heiden – 5240 x 100* *cw – 4000 x 100 OK*
2	King Salmon Levelock Igiugig	Wkdy - 2 Sat - 2 Sun. - 1	The present service involves some air taxi. As stated would handle all of the mail needs, 2 extra flights were required to handle 5 passengers during the year.	Expanding the service by one more Cessna 208 flight for 6 days week delivers all the passengers except 8 requiring four extra Sunday flights plus 70% of mail.	Clearly a "135" Route - should remain that way under the new postal law. *Levelock – 3280 x 60 OK* *Igiugig – 3000 x 75 OK*
3	King Salmon Egegik Pilot Point	Wkdy - 3 Sat - 3 Sun. - 1	The present service involves some air taxi. As stated would handle all of the mail needs. In the simulation 1 extra flight was required to handle 1 passenger during the year. This seems like more service than necessary.	Increasing the service to 4 flights every weekday and two on Sunday handled all the passengers and all but about 1% of the mail. The three simulation runs indicate that there may be two to four extra flights needed during the year.	Clearly a "135" Route - should remain that way under the new postal law. *Egegik – 5600 x 100 OK* *Pilot Point – 3280 x 75 OK* *Ugashik Bay – 5280 x 100 OK* *(considered part of Pilot Point)*
4	Dillingham Manokotak Togiak Twin Hills	Wkdy - 5 Sat - 3 Sun. - 3	This service will handle all the passengers and all but 4% of the mail requiring 15 added 208 flights per year. Changing the service to add 1900s 2 per weekday and 1 sat and sun improves the service but requires immediate upgrade of Twin Hills and Manokotak to 4000 feet.	The 2025 mail and passenger traffic forces the service into 4 Beech 1900s and 2 Dash-8s on the weekdays. An alternate service could be two TOG direct to DLG 1900's and the remainder a 208 route including all three villages.	If Togiak can have direct service twice a day then other two airports can remain as "135" airports. *Togiak – 4220 x 125 OK* *Manokotak – 2740 x 75 to 3300 x 75* *Twin Hills –- 3000 x 60 OK*
5	Dillingham Ekwok Koliganek New Stuyahok	Wkdy - 5 Sat - 4 Sun. - 4	The present service will handle all of the passengers and all the mail.	Expanding the service, by one more 208 flight (7 days) delivers essentially all but 4 of the passengers and 1.5% of the 70% mail assigned to the service.	Remain a heavily traveled "135" Route. *Ekwok – 2720 x 75 to 3300 x 75* *Koliganek – 3000 x 75 OK* *N Stuyahok – 1800 x 50 to 3300 x 75*
6	Iliamna to Kokhanok to Pedro Bay	Wkdy - 3 Sat - 2 Sun. - 2	Service provided by Iliamna Air Taxi, scheduled service only listed for 3 days/week. From level of enplanements regular service was simulated as listed. Which was enough in 2000.	Expanding service by adding one Saturday flight handles all but about 4% of the mail and 5 passengers.	Clearly a "135" Route and should remain that way under new postal law. *Kokhanok – 3000 x 60 OK* *Pedro Bay – 2900 x 60 OK*
7	Iliamna to Nondalton to Port Alsworth	Wkdy - 3 Sat - 3 Sun. - 2	Service provided by Iliamna Air Taxi, scheduled service only listed for 3 days/week. From level of enplanements regular service was simulated as listed. Which was enough in 2000.	Expanding service by adding one flight each day handles all but 5% of the mail. But the simulation showed a passenger overload of about 300/yr. This required an added 60 207 flights and 15 208's.	One airport is private and the other should be brought up to state standards. *Nondalton – 2800 x 75 to 3300 x 75* *Port Alsworth (private) – 3000 x 100 OK*
8	Dillingham Clark's Point Ekuk	Wkdy - 5 Sat - 4 Sun. - 4	So close to Dillingham with seasonal swings that service was not simulated.		*Clarks Pt – 2600 x 70* *Ekuk Private Fishery – 1200 x 40 (Road to Clarks Point or Upgrade)*
9	South Naknek	N/A	Present service OK.	Connected by Bridge and Road to King Salmon	*South Naknek – 3110 x 60 OK*

A "135" route refers to one served by aircraft with fewer than 10 seats, for which the minimum state standard 3300-foot runway length is designed (and sufficient). See explanation on page A-4.

Appendix B: Freight Cost Savings

Building and rehabilitating selected roadway linkages in the Southwest Alaska study area has the potential to save millions of dollars a year in freight movement costs. Because of its remoteness, skeletal surface transportation infrastructure, and challenging weather and topography, Southwest Alaskans experience some of the nation's highest freight movement costs. These costs impose significant constraints on residents' quality of life and on their communities' and region's ability to develop and support a stable, diversified economic base.

The roadway links proposed as part of this transportation plan are expected to have significant impacts on the costs and logistics of regional freight movement. Being able to truck goods from study area ports including Chignik and Williamsport, as opposed to having to barge them all the way around the Alaska Peninsula or fly them in from Anchorage, would be far less expensive than under current routing and mode splits.

It is possible to determine just how much less expensive by forecasting future volumes of cargo consumption, estimating current rates under the existing infrastructure and by estimating future rates under the proposed roadway linkages, which are much lower.

The "non-roadway" marine and aviation improvements are not included in the freight movement analysis because they are not expected to have significant freight movement impacts. Ferry service is not currently, and is not expected to be a significant player in regional freight movement. By large margins, commercial marine shipping and barge companies are able to move goods into and through the region more quickly and less expensively than the AMHS. Mission, service frequency, speed, and number of transfers required are among the reasons for commercial shippers' cost advantages.

Likewise, the aviation improvements proposed as part of this regional transportation plan are not expected to have significant freight movement impacts – at least not at the level of analysis supportable by available data. Several of the aviation improvements proposed would lengthen selected study area runways. Increasing runway length allows airports to accommodate larger planes that can carry larger amounts of cargo, presumably at a lower unit cost. Any freight movement cost savings achieved through lengthening runways would be marginal and discernible only at the microeconomic level.

In contrast, the projects that involve roadway links are anticipated to spark large-scale modal shifts. Accordingly, cost differences at a much higher level of magnitude are also anticipated. Moreover, the level of precision that would be required to assess the economic impacts longer runways far exceeds the precision of available study area data.

At the heart of the analysis are estimates of current and forecast consumption of goods, including petroleum products. Existing (1999) freight movement costs and modal splits (e.g., the percentage of goods by volume carried by commercial marine and air shipment, respectively) are also estimated. These estimates are inputs into the calculation of total freight movement costs into the future under existing (1999) conditions; that is, given the existing freight movement infrastructure.

In order to compare these costs with the costs that would be incurred if given links were developed, separate rate calculations and mode splits are modeled under specified changes in

the freight movement infrastructure. This changed infrastructure entails roadway linkages among a number of study area communities and between these communities and major marine ports. These rate and mode split estimates are then applied to the forecast volumes. The end result is a comparison of total freight movement costs under existing conditions versus under total freight movement costs under the specified surface transportation improvements.

The freight movement impact of any individual link is very much a function of how many other contiguous links are implemented. The number of possible combinations of individual links that might be implemented at any point in time is very high. For this reason, it would not have been feasible to assess the economic impact of every possible combination of links.

Instead, two separate scenarios were explored. Under **Scenario 1**, it is assumed that all proposed roadway links and navigation and harbor improvements are implemented. Under **Scenario 2**, it is assumed that only select elements of the Cook Inlet to Bristol Bay Corridor are implemented: namely, the navigational improvements at Williamsport and rehabilitation of the existing road and bridges between Williamsport and Pile Bay.

To assess the cost savings achievable from making the proposed transportation improvements, one simply multiplies the forecast volume of goods for the 2020 design year by rates under existing conditions and by rates with the proposed improvements. Put simply, the difference between these totals represents the freight movement savings achievable by implementing the proposed improvements. Results for Scenario 1 and Scenario 2 are provided separately.

It should be noted that the existing freight rates shown are based on 1999 data. In some cases the rates may be older. Freight rates have grown considerably since 1999, primarily because of increases in transportation fuel costs, which have approximately doubled from 1999 to 2004. Thus the cost savings estimates presented are probably low; higher savings would likely be realized.

Scenario 1: Implement the Cook Inlet to Bristol Bay and Alaska Peninsula Roadway System

Petroleum Movement Cost Savings

Substantial savings in petroleum movement costs can be anticipated if Scenario 1 is implemented. Petroleum movement rates are much decreased from communities that are now particularly inaccessible, such as Chignik Lake, where the shipment rate is projected to fall from $0.60 to $0.13 per gallon. Savings are even greater in Iliamna Lake communities, such as Iliamna, where petroleum shipment costs are anticipated to fall from $0.80 to $0.15 per gallon, a greater than a five-fold reduction. The road would have the greatest freight movement cost savings for those communities that are now hardest to reach – i.e., those surrounding Iliamna Lake.

Modest savings, in contrast, are anticipated in Naknek and King Salmon. Naknek is already served directly by relatively frequent barge service, as part of the larger Bristol Bay market, which also includes communities to the north, such as Dillingham. According to this analysis, the cost of petroleum movement to Naknek is projected to fall only a few cents – from $0.30 to $0.27 per gallon.

In all, 2020 cost savings due to petroleum movement alone are estimated at $802,600 per year. Actual savings could be higher or lower, based on factors including deviations from the

population base forecast; the extent to which the improvements encourage competition, which could further lower rates; and the extent to which the improvements foster other forms of economic development, such as tourism.

Volume increases spurred by such development could further reduce rates. But rates could be higher than forecast if

- significant operating costs faced by shippers have not been taken into consideration;
- if operating conditions on the proposed roadway prove more difficult to manage and maintain than anticipated; and
- if other economic mainstays in the study area falter, reducing both population levels and the demand for goods shipment.

Beyond the shipping cost savings suggested by this analysis, other economic and social benefits would accrue through implementation of the road, in terms of petroleum shipment alone. According to Lake and Peninsula School District administrator, Dennis Niedermeyer, the higher cost of shipping petroleum in winter months (when it must be flown into inland communities, and to Bristol Bay communities) effectively forces Southwest Alaska residents to "stock up" during the periods when petroleum can be barged in. However, communities are hard pressed to find storage capacity for all of the fuel needs, which can vary significantly by the harshness of a given winter. In his view, overtaxing fuel storage facilities creates problems in and of itself, such as fuel leaks and spills, whose cleanup is costly – both environmentally and financially. Another of the road's advantages would be reduced dependence on air shipment of petroleum products, which has safety drawbacks.

Petroleum Movement Cost Savings Summary

Total petroleum freight movement cost savings from building the Cook Inlet to Bristol Bay and Alaska Peninsula Roadway is estimated at $802,600 annually (Table B-1).

Table B-1
Estimated Petroleum Movement Cost Savings
Scenario 1

	2020 Forecast Consumption (gal)	1999 Rate ($/gal)	Estimated Rate with Road[1] ($/gal)	Assumes Product Shipped through	2020 Cost Estimate Using 1999 Rates ($ paid)	2020 Cost Estimate Assuming Scenario 1 is Implemented ($ paid)	2020 Savings Achievable ($ saved)
Chignik	65,570	$0.250	$0.120	Chignik	$16,400	$7,900	$8,500
Chignik Lagoon	122,950	$0.500	$0.130	Chignik	$61,500	$16,000	$45,500
Chignik Lake	163,930	$0.600	$0.130	Chignik	$98,400	$21,300	$77,100
Dillingham	2,795,080	$0.300	$0.300	Williamsport	$838,500	$838,500	$0
Aleknagik	229,510	$0.300	$0.300	Williamsport	$68,900	$68,900	$0
Egegik	139,340	$0.500	$0.300	Chignik	$69,700	$41,800	$27,900
Igiugig	73,770	$0.800	$0.200	Williamsport	$59,000	$14,800	$44,200
Iliamna/Newhalen	303,280	$0.800	$0.150	Williamsport	$242,600	$45,500	$197,100
Nondalton	270,490	$0.800	$0.160	Williamsport	$216,400	$43,300	$173,100
Ivanof Bay	16,390	$0.270	$0.170	Chignik	$4,400	$2,800	$1,600
King Salmon/Naknek	1,139,340	$0.300	$0.270	Williamsport	$341,800	$307,600	$34,200
Levelock	139,340	$0.800	$0.230	Williamsport	$111,500	$32,000	$79,500
Pedro Bay	49,180	$0.800	$0.120	Williamsport	$39,300	$5,900	$33,400
Perryville	114,750	$0.300	$0.170	Chignik	$34,400	$19,500	$14,900
Pilot Point	131,150	$0.520	$0.250	Chignik	$68,200	$32,800	$35,400
Port Heiden	139,340	$0.350	$0.180	Chignik	$48,800	$25,100	$23,700
South Naknek	139,340	$0.300	$0.270	Williamsport	$41,800	$37,600	$4,200
Ugashik	8,200	$0.520	$0.250	Chignik	$4,300	$2,000	$2,300
			TOTALS		**$2,365,900**	**$1,563,300**	**$802,600**

[1] This cost estimate assumes that a tanker truck with a 7,500-gallon capacity is used.

"Other" Cargo Movement Cost Savings

Cargo movement savings achievable by implementing Scenario 1 are anticipated in two major areas. The first, and the primary focus of this assessment, is the savings that can be achieved in moving goods and commodities to communities in Southwest Alaska. The second has to do with savings achievable by providing the region's gillnet fishers a more viable route between their fishing grounds in Bristol Bay, and Cook Inlet, where many store their vessels during the off-season, and where many have repair and maintenance done. These impacts are explored separately.

Commodities Movement impacts

Listed in Table B-2 is a summary of estimated cost savings in commodities movements based on the rate calculations, and port call assumptions earlier discussed. This analysis suggests that around $13,057,100 per year could be saved in freight costs in terms of moving "Other" cargo alone, if Scenario 1 is implemented. Note that cargo shipment mode shift under the proposed infrastructure improvements had to be taken into account in this analysis. These mode shift assumptions are documented in Table B-2. These mode shift assumptions under both existing conditions and under the assumption that Scenario 1 is built are based on primary source data and area shippers' input.

A few explanations regarding the Iliamna Lake communities are needed to interpret Table B-2. First, a weighted average was used in calculating the marine shipment rate under existing (1999) conditions for Iliamna Lake communities. This weighted average takes into account the percentage shipped, and rates paid, for marine freight via Naknek and Williamsport, respectively. In terms of projected rates, this analysis assumes that if the Trans-Peninsula Roadway is built, that most waterborne cargo will be shipped to Iliamna Lake communities via Williamsport.

Table B-2
Estimated "Other" Cargo Cost Savings
Scenario 1

	Mode Split and Rates Under Existing (1999) Conditions									Results		
	Marine %	Air %	Marine ($/lb.)	Air ($/lb.)	2020 Freight Volume Estimate (lbs.)	Barge/Road %	Air %	Barge/Road ($/lb.)	Air ($/lb.)	Freight Costs Paid in 2020 Assuming No Change ($)	Freight Costs Paid in 2020 Assuming Scenario 1 is Implemented ($)	Savings Possible due to Scenario 1 ($)
Chignik	90%	10%	0.250	0.980	648,000	90%	10%	0.220	0.980	$209,300	$191,800	$17,500
Chignik Lagoon	85%	15%	0.500	0.980	1,620,000	90%	10%	0.223	0.980	$926,600	$483,900	$442,700
Chignik Lake	70%	30%	0.600	0.980	1,215,000	90%	10%	0.224	0.980	$867,500	$364,000	$503,500
Dillingham	75%	25%	0.510	0.420	27,621,000	85%	15%	0.325	0.420	$13,465,200	$9,370,400	$4,094,800
Aleknagik	75%	25%	0.655	0.670	2,268,000	85%	15%	0.325	0.420	$1,494,000	$769,400	$724,600
Egegik	55%	45%	0.500	0.670	1,377,000	85%	15%	0.270	0.670	$793,800	$454,400	$339,400
Igiugig	70%	30%	0.686	0.640	729,000	85%	15%	0.297	0.640	$490,000	$254,000	$236,000
Iliamna/Newhalen	65%	35%	0.686	0.390	2,997,000	85%	15%	0.283	0.390	$1,745,500	$896,300	$849,200
Nondalton	65%	35%	0.802	0.640	2,673,000	85%	15%	0.283	0.390	$1,992,200	$799,400	$1,192,800
Ivanof Bay	85%	15%	0.700	1.090	162,000	90%	10%	0.232	1.090	$122,900	$51,500	$71,400
King Salmon/Naknek	75%	25%	0.510	0.420	11,259,000	85%	15%	0.286	0.420	$5,488,800	$3,446,400	$2,042,400
Levelock	75%	25%	0.765	0.640	1,377,000	85%	15%	0.298	0.640	$1,010,400	$481,000	$529,400
Pedro Bay	60%	40%	0.686	0.640	486,000	85%	15%	0.276	0.640	$324,500	$160,700	$163,800
Perryville	80%	20%	0.600	1.070	1,134,000	90%	10%	0.230	1.070	$787,000	$356,100	$430,900
Pilot Point	40%	60%	0.520	0.780	1,296,000	85%	15%	0.264	0.780	$876,100	$442,500	$433,600
Port Heiden	25%	75%	0.510	0.870	1,377,000	85%	15%	0.238	0.870	$1,074,100	$458,300	$615,800
South Naknek	75%	25%	0.510	0.670	1,377,000	85%	15%	0.286	0.420	$757,400	$421,500	$335,900
Ugashik	10%	90%	0.520	0.780	81,000	85%	15%	0.264	0.780	$61,100	$27,700	$33,400

TOTALS	**59,697,000**	**$32,486,400**	**$19,429,300**	**$13,057,100**

Gillnet Fleet Transport Impacts

In its 1995 economic assessment, the US Army Corps of Engineers (USCOE) pointed out another area of savings that could be realized if these improvements were made. They point to the many gillnet vessels that each year make the trip from Cook Inlet to the fisheries in Bristol Bay and back. Some vessels are transported because they spend the off-season in Cook Inlet; others make the trip periodically for repairs and maintenance purposed. In all, about 825 gillnet boats are estimated to make the round trip each year.

Of these, the vast majority (about 785) sail around the Alaska Peninsula, a 1,100-mile trip that takes three days, and is estimated to cost $1,800. A small contingent (about 40), however, makes the trip via Williamsport, which is almost a thousand miles shorter and is estimated to cost about $1,233 per vessel. Although this trip is less costly in terms of both time and dollars, it is arduous, risky, and can only be undertaken during narrow time windows. Moreover, many gillnet vessels cannot be transported via this route because they are too wide to pass through existing bridges.

According to the US Army Corps of Engineers' detailed analysis, savings in the neighborhood of $1,082,500 could be achieved on the part of gillnet vessel movement alone if the Williamsport Channel were dredged, and if the existing Williamsport to Pile Bay Road and its bridges were rehabilitated.[30] Accordingly, these estimated savings are added to the freight movement savings estimated earlier.

"Other" Cargo Movement Cost Savings Summary

Total freight movement cost savings under Scenario 1 is estimated at $14,942,200. Of this total, $1,082,500 is attributable to gillnet vessel transport savings. To these savings can be added $802,600 in petroleum movement savings, along with $13,057,100 in "Other" commodity movement savings (Table B-3).

Table B-3
Scenario 1
Freight Movement Cost Savings Summary

Petroleum	**$802,600**
Gillnet Fleet	**$1,082,500**
Other Cargo	**$13,057,100**
TOTAL	**$14,942,200**

[30] According to the USCOE, the number of gillnet vessels taking the Williamsport route would increase from 40 to 747 round trips per year (*Navigation Channel Feasibility Report and Environmental Assessment, Williamsport*, US Army Corps of Engineers, Alaska District, December 1995).

Scenario 2: Implement Williamsport to Pile Bay Improvements

If the Williamsport to Pile Bay Road were rehabilitated, in tandem with navigational improvements at Williamsport, it is estimated that most of the Iliamna Lake-bound cargo now barged up the Kvichak River from Naknek would shift to the Williamsport route. In addition, since marine transport under this scenario would be viable from June through November (a much larger portion of the year than is now the case) it is also assumed that a portion of the cargo now flown into Iliamna Lake communities would be barged, trucked, and then shipped again via Williamsport. Whereas the mode split for Iliamna Lake communities is currently estimated to be from 48% to 56% marine via Naknek, from 12% to 14% marine via Williamsport, and from 30% to 40% by air; with the proposed improvements, cargo volumes are assumed to shift to 10% marine via Naknek; 65% marine via Williamsport; and 25% by air.

It is estimated that these improvements would lower the cost of moving cargo to Iliamna Lake communities (via a surface route) from 37 to 24 cents per pound. When the assumed mode shift and rate values are applied to the cargo forecast volumes for the 2020 design year, savings attributable to the project can be calculated, as shown in Table B-4. Because these improvements' value would be comparable to that of building the entire Trans-Peninsula Roadway system in terms of allowing gillnet fleet passage across the Alaska Peninsula, the same yearly savings can be assumed for this stand-alone element. Accordingly, $1,082,500 in gillnet fleet savings can be added to the $2,765,900[31] figure for "Other" cargo. In all, freight movement savings achievable under this scenario are estimated at $3,848,400 per year (Table B-5).

[31] The November 2002 analysis assumed that the Nondalton-Iliamna Road and the Wood River Bridge are in place in the baseline and thus freight costs to Nondalton would be the same as to Iliamna and that freight costs to Aleknagik would be the same as to Dillingham under "existing" conditions. The change from $2,472,100 to $2,765,900 results from changing this assumption concerning the baseline.

Table B-4
Estimated "Other" Cargo Cost Savings
Scenario 2

	2020 Forecast "Other" Cargo (lbs.)	Mode Split, Rates and Costs Under Existing (1999) Conditions				Mode Split, Rates and Costs Under Scenario 2				
		Marine via Naknek	Marine via Wmsport	Air	TOTAL Freight Costs Paid	Marine via Naknek	Marine via Wmsport	Air	TOTAL Freight Costs Paid	Savings Due to Scenario 2
Pedro Bay										
Mode Split	486,000	48%	12%	40%	$324,500	10%	65%	25%	$190,800	**$133,700**
Rate		$0.765	$0.370	$0.640		$0.765	$0.240	$0.640		
Iliamna/Newhalen										
Mode Split	2,997,000	52%	13%	35%	$1,745,500	10%	65%	25%	$989,000	**$756,500**
Rate		$0.765	$0.370	$0.390		$0.765	$0.240	$0.390		
Nondalton										
Mode Split	2,673,000	52%	13%	35%	$1,992,200	10%	65%	25%	$882,100	**$1,110,100**
Rate		$0.910	$0.370	$0.640		$0.765	$0.240	$0.390		
Kokhanok										
Mode Split	2,025,000	52%	13%	35%	$1,356,500	10%	65%	25%	$794,800	**$561,700**
Rate		$0.765	$0.370	$0.640		$0.765	$0.240	$0.640		
Igiugig										
Mode Split	729,000	56%	14%	30%	$490,000	10%	65%	25%	$286,100	**$203,900**
Rate		$0.765	$0.370	$0.640		$0.765	$0.240	$0.640		
TOTALS					**$5,908,700**				**$3,142,800**	**$2,765,900**

Table B-5
Scenario 2
Freight Movement Cost Savings Summary

"Other" Cargo	**$2,765,900**
Gillnet Fleet	**$1,082,500**
TOTAL	**$3,848,400**

Appendix C: Technical Memorandum on Revised Cost and Effectiveness Measures

Introduction

The Southwest Alaska Transportation Plan, an approved component of the Alaska Statewide Transportation Plan, was completed in November 2002. The study area for the plan includes the Alaska Peninsula, Kodiak and its neighboring islands, the Aleutian Islands, the Bristol Bay area, and the Pribilof Islands.

The November 2002 Southwest Alaska Transportation Plan needs to be revised. The Alaska Department of Transportation and Public Facilities (ADOT&PF) has been directed by a legal decision to halt all work on the Iliamna–Nondalton road and bridge project until the economic costs and the benefits are considered in this next revision of the Southwest Plan. The revision will extract the Iliamna–Nondalton and the Dillingham–Aleknagik corridor projects from the baseline for the Southwest Plan and subject them to the economic analysis used to assess other projects in the Southwest Alaska Transportation Plan. The Plan revision process will consist of the production of a technical memorandum and a draft revised Southwest Alaska Transportation Plan, review by the Southwest Alaska Transportation Plan Advisory Committee and by the general public, and then production of a final revised document.

The Iliamna–Nondalton (Figure C1) and Dillingham–Aleknagik (Figure C2) corridor projects involve two categories of plan elements described in the November 2002 Southwest Alaska Transportation Plan document, Cook Inlet to Bristol Bay Corridor – Land Transportation System and Dillingham/Bristol Bay Area – Land Transportation System.

Evaluation Methodology

The evaluation methodology for the Iliamna–Nondalton and Dillingham–Aleknagik projects is the same as that used for other land transportation projects in the November 2002 Southwest Alaska Transportation Plan. The evaluation methodology considers the benefits and costs of the proposed new transportation facilities. Within the context of Southwest Alaska Transportation Plan process, a project's benefits are defined by how it relates to the goals established for the Plan:

Goal 1: Provide Basic Access for Health, Education and Safety

Provide communities of Southwest Alaska with usable and safe access to clean water, sanitation, and basic social services, including medical services, schools and law enforcement.

Goal 2: Assure the Preservation of the Needed Transportation System

Preserve and maintain existing transportation facilities and services that have been identified as necessary for both current and future conditions.

Goal 3: Enhance Transportation System Efficiency

Provide regional transportation facilities and services in the most efficient and cost-effective way possible.

Goal 4: Improve Transportation Levels of Services

Improve the frequency, reliability and quality of regional transportation services.

Figure C1: Iliamna–Nondalton Road

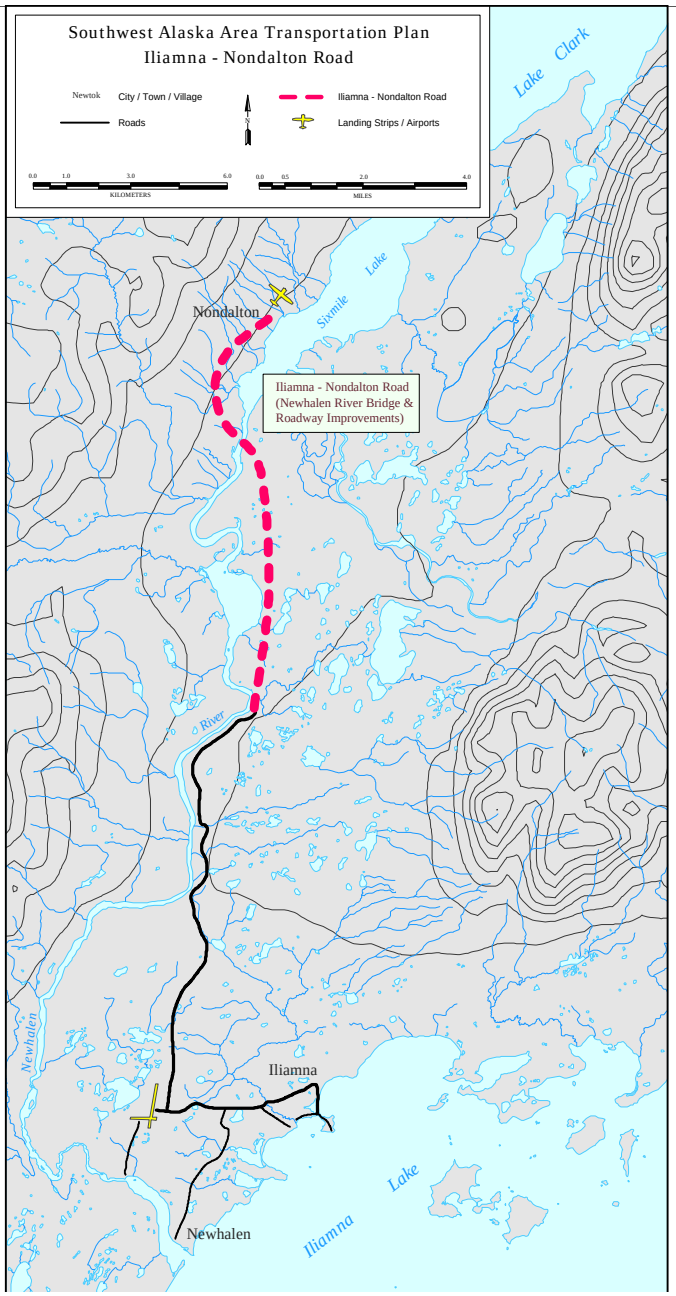
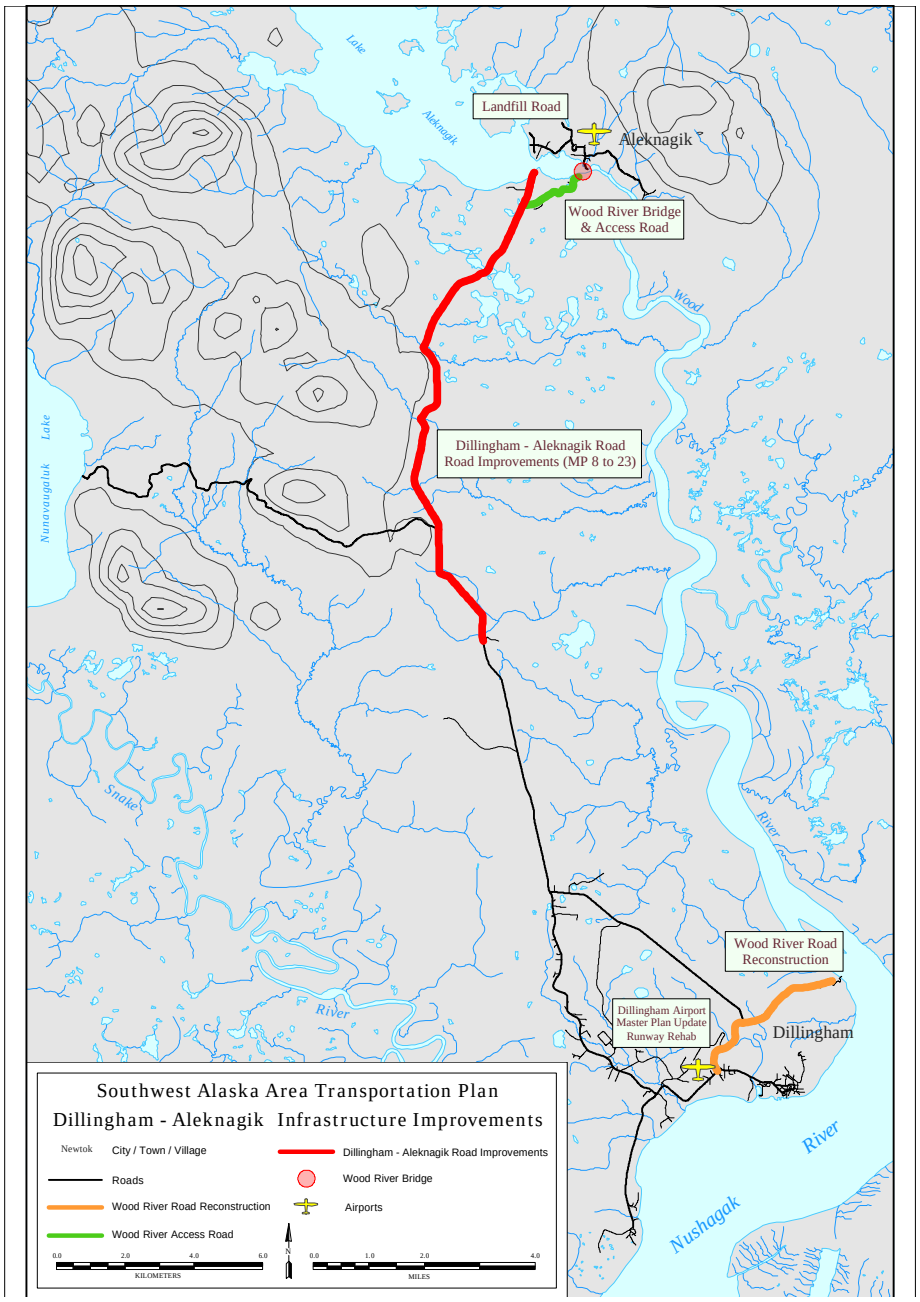


Figure C2: Dillingham and Aleknagik Area Improvements



Goal 5: Enhance System Adaptability and Flexibility

Develop and maintain a regional transportation system that can effectively adapt to changing physical, economic and demographic conditions with minimum "throw away" costs.

Goal 6: Develop and Protect Economic and Subsistence Resources

Provide transportation facilities and services that support regional economic vitality while maintaining the region's unique environmental and cultural resources.

In order to compare projects, it is necessary to devise a measure that can be readily estimated for each project while reflecting its success in meeting some or all of the goals of the Plan. A review of the goals indicates that such a measure cannot be expressed merely in monetary terms, particularly for a goal such as providing basic access for health, education and safety. Rather a measure was chosen that reflects the success of the proposed project by its use – estimated year 2020 person trips on the facility. The methodology for estimating year 2020 person trips is described in *Southwest Alaska Transportation Plan – Description of Alternatives Technical Memorandum, Appendix H: Demand Estimate Methodologies* (August 1999).

Using a non-monetary measure of benefits, demanded by the nature of the Southwest Alaska Transportation Plan Goals, requires use of an evaluation framework other than the type of benefit-cost analysis that was often used for infrastructure projects in past years. A traditional benefit-cost analysis required that all benefits and all costs be expressed in monetary terms. This required that dollar values be placed on such benefits as saving lives. While monetizing such benefits has always been problematic, the planning profession has increasing recognized that trying to fit a wide variety of benefits (and costs also, such as environmental impacts) into a purely economic framework is inconsistent with the way people and society truly make decisions. A solution is to use a cost-effectiveness evaluation framework where a measure of effectiveness, such as year 2020 person trips, is compared against the net cost of the project. The use of "net cost" allows the value of those benefits that can be expressed in dollar terms, such as estimated reduction in the price of freight delivered to communities, to be subtracted from project costs that are also expressed in dollar terms. In order to compare against an annual measure of effectiveness, it is most useful to express net cost in annual terms also.

For the Southwest Alaska Transportation Plan evaluation methodology, the net annualized cost consists of several elements: the annual operations and maintenance (O&M) cost of the segment (assuming the segment is open year round); plus an annualized capital cost for the segment; minus the estimated annual freight cost savings resulting from implementation of the roadway system, allocated to each segment.

The annualized capital cost was calculated for each project based upon the total capital cost and an assumed 20-year design life of each project. Using a 7% discount rate, the annualized cost is the annual payment over 20 years that is equivalent in present value to the total capital cost for each project. Use of this annualization approach facilitates the useful comparison of capital costs to O&M costs on an annual basis. The methodology for estimating capital and O&M costs is described in *Southwest Alaska Transportation Plan – Description of Alternatives Technical Memorandum, Appendix C: Roadway Link Cost Analysis* (August 1999).

Calculation of the freight cost savings and allocation of these savings to roadway segments is described in the Freight Cost Savings section of this Appendix. It should be noted that the existing freight rates used in the calculations are based on 1999 data. In some cases the rates

may be older. Freight rates have grown considerably since 1999, primarily because of increases in transportation fuel costs, which have approximately doubled from 1999 to 2004. Thus the cost savings estimates presented are probably low; higher savings would likely be realized. A more detailed discussion of freight cost savings is contained in *Southwest Alaska Transportation Plan – Freight Impact Analysis of Potential Alaska Peninsula Roadway Segments and Regional Freight Movement Summary Technical Memorandum* (March 2000).

The next section, Findings, describes evaluation results and the recommended priority order for roadway segments in the Cook Inlet to Bristol Bay Corridor and in the Dillingham/Bristol Bay Area, based on the cost and effectiveness measures calculated for each segment.

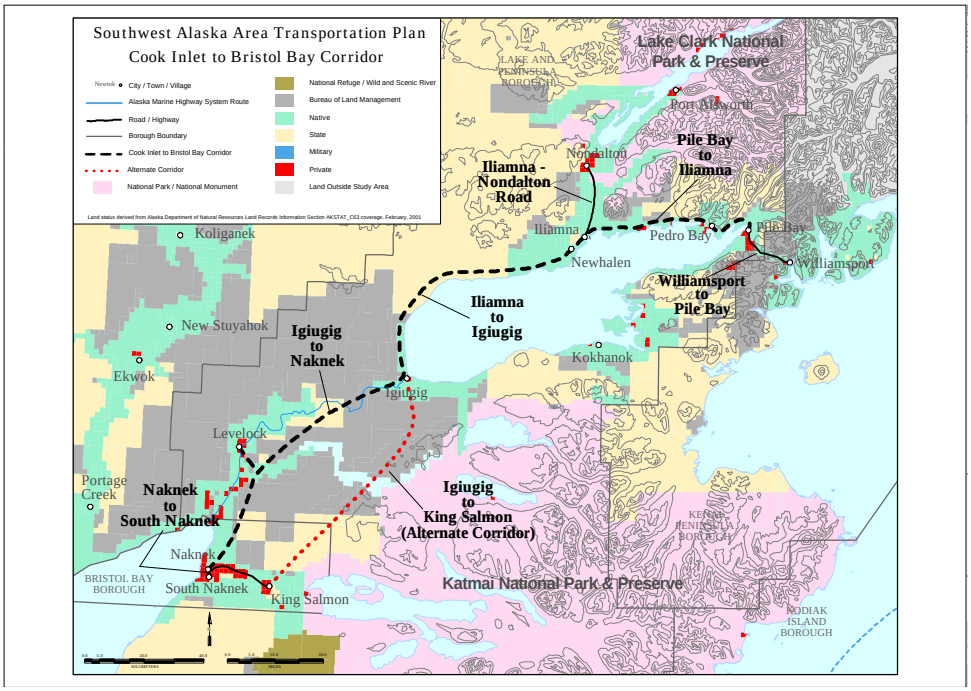
Findings

Cook Inlet to Bristol Bay Corridor

The Southwest Alaska Transportation Plan proposes the development, over time, of a surface transportation link between Cook Inlet and Bristol Bay (Figure C3). This roadway would improve mobility and access for many communities in the area, including Pedro Bay, Nondalton, Iliamna, Newhalen, Igiugig, Naknek and King Salmon – providing them for the first time with a well developed surface transportation link to the Kenai Peninsula, Anchorage, and the state's primary roadway network. The road also has significant potential for improving the efficiency of regional freight movement and economic development. Benefits to the region and to the communities along the proposed corridor include the following:

- It would open up a shorter, safer, less expensive freight route from Cook Inlet to Bristol Bay; it would no longer be necessary to transport goods by barge all the way around the Alaska Peninsula.
- By making scenic areas, businesses, and lodges along the corridor more accessible to visitors, this alternative would support tourism in the region.
- The road would provide the communities of interior Southwest Alaska with greater connectivity to one another, which would promote their economic development.
- The project would promote economic efficiency and diversification in the communities dependent on the Bristol Bay fishery. Boat repair and storage facilities are limited in Bristol Bay, requiring many boat owners to bring their boats to Homer. The overland route would avoid the time-consuming and hazardous open ocean voyage around the Alaska Peninsula, thereby saving money and increasing safety. Use of the route also would save deterioration of fishing boats not designed for extensive open-ocean travel.

Figure C3: Cook Inlet to Bristol Bay Corridor



The segments of the corridor will need to be developed over time. Table C-1 presents a recommended priority order for construction of the segments.[32]

Table C-1
Recommended Priority Order for Road Construction
Cook Inlet to Bristol Bay Corridor

Segment	Estimated Capital Cost
Williamsport to Pile Bay	$22,285,000
Iliamna to Nondalton	$12,520,000
Naknek to South Naknek	$30,602,000
Pile Bay to Pedro Bay to Iliamna	$51,870,000
Iliamna to Igiugig	$87,880,000
Igiugig to Naknek	$127,675,000

At present, it appears that only the first three segments, Williamsport to Pile Bay, Iliamna to Nondalton, and Naknek to South Naknek, are likely to be constructed in the next 20-year period. However, circumstances could occur that might trigger consideration of an earlier implementation for some of the segments:

- Rapid population growth in one or both communities connected by the potential link, or a combined population rise to double the figure forecasted for year 2020.
- Discovery of high value resource that could potentially be accessed economically through development of the link.[33]
- Major business/economic development in one or both communities connected by the potential link.
- Availability of new transportation technology that dramatically reduces capital and/or operating costs for a particular link
- Catastrophic natural disaster that alters normal transportation development pattern.

Table C-2 describes cost and effectiveness measures for each of the Cook Inlet to Bristol Bay Corridor roadway segments. Two sets of estimated annual 2020 person trips are shown. The first reflects estimated travel if only the Cook Inlet to Bristol Bay Roadway System is implemented; i.e. assuming that neither the roadway connection to Dillingham nor the Alaska Peninsula roadway from South Naknek to Ivanof Bay is implemented. The second set of demand numbers assume that all the proposed roadway connections are implemented.

The first recommended segment, Williamsport to Pile Bay, has the lowest net annualized cost of the group. The second segment, Iliamna to Nondalton, has the second lowest net annualized

[32] The segments listed in Table C-1 have been studied at varying levels of detail. Some, such as the Iliamna–Nondalton Road, have most engineering and environmental documentation completed. Others segments are only conceptual at this time. As they are studied further, alternative alignments and possibly alternative modes other than roadway may emerge as preferred solutions.

[33] The Pebble Gold-Copper Mine, in particular, may accelerate the development of a roadway on the north side of Iliamna Lake. The port requirements for the mining project may also dictate development of a port on Iniskin Bay, with a road connection to Iliamna Lake, in addition to the existing connection between Williamsport and Pile Bay.

cost of the group and has the second lowest net annualized cost per person trip, assuming implementation of just the Cook Inlet to Bristol Bay Roadway System.[34] The third segment, Naknek to South Naknek, has the second lowest net annualized cost per person trip, assuming implementation of both the Cook Inlet to Bristol Bay Roadway System and the Alaska Peninsula Roadway System. The Naknek to South Naknek connection, by providing access for South Naknek residents to the communities on the north side of the Naknek River and to the regional airport at King Salmon, would shift the purpose of the South Naknek airport away from its current role as primary community access. With a bridge connection to South Naknek, the appropriate roles and ownership of all the airports in the Bristol Bay Borough, South Naknek, Naknek and King Salmon, should be re-examined.

[34] The Iliamna to Nondalton segment was also examined as a stand-alone project, i.e. assuming its completion without implementation of the Cook Inlet to Bristol Bay Roadway System. This is described as Scenario 3 in the Freight Cost Savings section of this Appendix. Under this assumption the segment would have a Net Annualized Cost of $971,860; 75,300 estimated annual 2020 person trips; and a Net Annualized Cost per Person Trip of $12.91.

Table C-2
Cost and Effectiveness Measures of Proposed Roadway Segments
Cook Inlet to Bristol Bay Corridor

Segment	Annual O&M Cost	Annualized Capital Cost @ 7% Interest	Annualized Capital Cost plus O&M Cost	Estimated Annual Freight Cost Savings	Net Annualized Cost	Cook Inlet to Bristol Bay Roadway System Only		Full System	
						Estimated Annual 2020 Person Trips	Net Annualized Cost per Person Trip	Estimated Annual 2020 Person Trips	Net Annualized Cost per Person Trip
Williamsport to Pile Bay	$209,250	$2,577,550[1]	$2,786,800	$3,848,400[2]	$0	1,900	$0.00	5,000	$0.00
Pile Bay to Pedro Bay to Iliamna	$513,000	$4,896,160	$5,409,200	$2,247,800[3]	$3,161,400	22,900	$138.05	33,300	$94.94
Iliamna to Nondalton	$225,450	$1,181,810	$1,407,260	$115,800[3]	$1,291,460	99,300	$13.01	114,900	$11.24
Iliamna to Igiugig	$756,000	$8,295,250	$9,051,300	$1,974,700[3]	$7,076,600	115,800	$61.11	126,300	$56.03
Igiugig to Naknek	$1,012,500	$12,051,620	$13,064,100	$599,100[3]	$12,465,000	127,500	$97.76	214,450	$58.13
Naknek to South Naknek	$61,290	$2,888,830	$2,950,120	$83,900[3]	$2,866,220	115,400	$24.84	278,300	$10.30

[1] The capital cost used in this calculation includes the Williamsport to Pile Bay roadway improvements as well as navigation improvements at Williamsport and construction of a public dock and boat launch at Pile Bay.

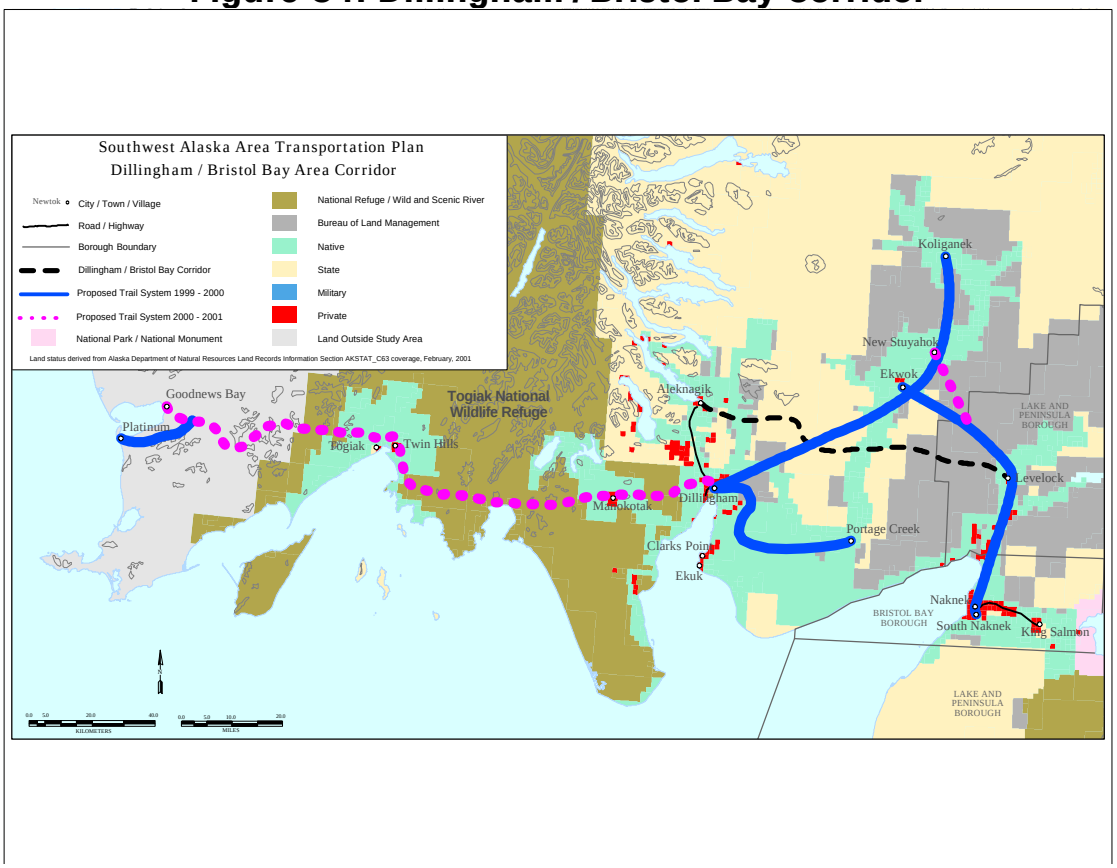
[2] See Table C-9. The freight cost savings are based on 1999 freight costs. Since freight costs have increased considerably since 1999 it is likely that higher freight cost savings would be realized with implementation of the roadway segments.

[3] See Table C-12. The freight cost savings are based on 1999 freight costs. Since freight costs have increased considerably since 1999 it is likely that higher freight cost savings would be realized with implementation of the roadway segments.

Dillingham / Bristol Bay Area

In the Dillingham/Bristol Bay Area the Southwest Alaska Transportation Plan recommends the development, over time, of a roadway connection between Dillingham and the Cook Inlet to Bristol Bay roadway system (Figure C4).

Figure C4: Dillingham / Bristol Bay Corridor



The segments of the corridor will need to be developed over time. Table C-3 presents a recommended priority order for construction of the segments. At present, it appears that only the first segment, Dillingham to Aleknagik, is likely to be constructed in the next 20-year period. However changing circumstances could trigger consideration of an earlier implementation for some of the segments. [35]

[35] The segments listed in Table C-3 have been studied at varying levels of detail. Some, such as the Dillingham–Aleknagik Road and Wood River Bridge, have some engineering and environmental documentation completed. Others segments are only conceptual at this time. As they are studied further, alternative alignments and possibly alternative modes other than roadway may emerge as preferred solutions.

Table C-3
Recommended Priority Order for Road Construction
Dillingham / Bristol Bay Area

Segment	Estimated Capital Cost
Dillingham to Aleknagik	$17,600,000
Jct. w/ Igiugig Road to Levelock	$43,635,000
Levelock to Aleknagik	$167,240,000

Table C-4 describes cost and effectiveness measures for these roadway segments. The Dillingham to Aleknagik segment has the lowest Net Annualized Cost and the lowest Net Annualized Cost per Person Trip.[36] The remainder of the roadway connection between Dillingham and the Cook Inlet to Bristol Bay road would be developed over time, starting with a connection between Levelock and the Igiugig to Naknek road, and then followed by the segment between Levelock and Aleknagik. These latter two segments are not envisioned in the next 20 years; until the Cook Inlet to Bristol Bay corridor is fully developed there is little justification for investing the resources needed to develop and maintain them.

Table C-4
Cost and Effectiveness Measures of
Proposed Roadway Segments
Dillingham / Bristol Bay Area

						Full System	
Segment	**Annual O&M Cost**	**Annualized Capital Cost @ 7% Interest**	**Annualized Capital Cost plus O&M Cost**	**Estimated Annual Freight Cost Savings**	**Net Annualized Cost**	**Estimated Annual 2020 Person Trips**	**Net Annualized Cost per Person Trip**
Jct. w/ Igiugig Road to Levelock	$256,500	$4,118,840	$4,375,300	$1,343,400[1]	$3,031,900	307,500	$9.86
Levelock to Aleknagik	$972,000	$15,786,270	$16,758,300	$1,170,900[1]	$15,587,400	311,200	$50.09
Aleknagik to Dillingham	$240,300	$3,129,360	$3,369,700	$994,800[1]	$2,374,900	352,200	$6.74

[1] See Table C-12. The freight cost savings are based on 1999 freight costs. Since freight costs have increased considerably since 1999 it is likely that higher freight cost savings would be realized with implementation of the roadway segments.

[36] The Dillingham to Aleknagik segment was also examined as a stand-alone project, i.e. assuming its completion without connection to the Cook Inlet to Bristol Bay Roadway System. This is described as Scenario 3 in the Freight Cost Savings section of this Appendix. Under this assumption the segment would have a Net Annualized Cost of $2,981,400; 124,150 estimated annual 2020 person trips; and a Net Annualized Cost per Person Trip of $24.01.

Freight Cost Savings

The approach to estimating the cost savings for the movement of freight resulting from implementation of port and roadway improvements in Southwest Alaska is described in Appendix B of the Southwest Alaska Transportation Plan and in Freight Impact Analysis of Potential Alaska Peninsula Roadway Segments and Regional Freight Movement Summary Technical Memorandum (March 2000). Some of the material from these reports will be repeated here for background but the reader should refer to the other reports for more detail. Also, the other reports examined freight savings resulting from port and roadway improvements in three sections of Southwest Alaska, the Cook Inlet to Bristol Bay Roadway System, the Alaska Peninsula Roadway System, and the Dillingham/Bristol Bay Area. This appendix only examines the Cook Inlet to Bristol Bay Corridor and the Dillingham/Bristol Bay Area and, more specifically, focuses on the inclusion of the Iliamna–Nondalton and Dillingham–Aleknagik projects in the analysis. The analysis in the Southwest Alaska Transportation Plan, November 2002, assumed implementation of these two projects so freight cost savings resulting from the implementation of these individual links were not calculated. Rather freight cost savings that would benefit Nondalton, as a result of being connected to a Cook Inlet to Bristol Bay Roadway system, were aggregated with the freight cost savings that would benefit Iliamna and Newhalen. Similarly, freight cost savings that would benefit Aleknagik were aggregated with the savings that would benefit Dillingham.

Background

The roadway links proposed as part of the Southwest Alaska Transportation Plan are expected to have significant impacts on the costs and logistics of regional freight movement. Most freight is currently either barged around the Alaska Peninsula into Bristol Bay, and then for the Iliamna Lake communities offloaded, reloaded onto smaller vessels, and barged up the Kvichak River, or flown in from Anchorage. The new roadway links, together with navigation and port improvements, would enable goods to be moved by barge to Williamsport then by truck to their final destination, in many cases at considerably less expense.

It is possible to determine just how much less expensive by forecasting future volumes of cargo consumption, estimating current rates under the existing infrastructure and by estimating future rates under the proposed roadway linkages.

At the heart of the analysis are estimates of current and forecast consumption of goods, including petroleum products. Existing freight movement costs and modal splits (e.g., the percentage of goods by volume carried by commercial marine and air shipment, respectively) are also estimated. These estimates are inputs into the calculation of total freight movement costs into the future under existing conditions; that is, given the existing freight movement infrastructure.

In order to compare these costs with the costs that would be incurred if given links were developed, separate rate calculations and mode splits are modeled under specified changes in the freight movement infrastructure. This changed infrastructure entails roadway linkages among a number of study area communities and between these communities and major marine ports. These rate and mode split estimates are then applied to the forecast volumes. The end result is a comparison of total freight movement costs under existing conditions versus under total freight movement costs under the specified surface transportation improvements.

To assess the cost savings achievable from making the proposed transportation improvements, one simply multiplies the forecast volume of goods for the 2020 design year by rates under existing conditions and by rates with the proposed improvements. Put simply, the difference between these totals represents the freight movement savings achievable by implementing the proposed improvements.

The freight movement impact of any individual link is very much a function of how many other contiguous links are implemented. The number of possible combinations of individual links that might be implemented at any point in time is very high. For this reason, it would not have been feasible to assess the economic impact of every possible combination of links.

Instead, separate scenarios were explored. Under Scenario 1, it is assumed that full length of the Cook Inlet to Bristol Bay roadway is implemented, together with navigation and harbor improvements. Under Scenario 2, it is assumed that only select improvements in the Cook Inlet to Bristol Bay Corridor are implemented: namely, the navigational improvements at Williamsport and rehabilitation and widening of the existing road and bridges between Williamsport and Pile Bay. This scenario provides benefits only to communities on Iliamna Lake. In addition a third scenario is examined, specific to the Iliamna–Nondalton and Dillingham–Aleknagik projects. This scenario examines only the effects of these two projects, in the absence of any other assumed improvements.

Results for Scenario 1, Scenario 2, and Scenario 3 are provided separately. The results for Scenario 1, including Tables C-5, C-6 and C-7, are presented first, in the section entitled Scenario 1: Implement Entire Roadway System. Then the results for Scenario 2, including Tables C-8 and C-9, are presented in the section entitled Scenario 2: Implement Williamsport to Pile Bay Improvements. Finally the results for Scenario 3, including Table C-10, are presented in the section entitled Scenario 3: Implement Iliamna–Nondalton and Dillingham–Aleknagik Projects.

It should be noted that the existing freight rates shown are based on 1999 data. In some cases the rates may be older. Freight rates have grown considerably since 1999, primarily because of increases in transportation fuel costs, which have approximately doubled from 1999 to 2004. Thus the cost savings estimates presented are probably low; higher savings would likely be realized.

Scenario 1: Implement the Cook Inlet to Bristol Bay Roadway System

Petroleum Movement Cost Savings Summary

Building the Cook Inlet to Bristol Bay Roadway System would result in petroleum freight movement cost savings to most communities. Currently most petroleum is delivered by barge via Bristol Bay. The communities on Bristol Bay receive their shipments directly, while the communities on Iliamna Lake require that petroleum be transferred to smaller barges that navigate the Kvichak River during its brief season of navigability. This season, during which the river is both ice-free and high enough to support even shallow-draft vessels, generally runs from August to November. As shown in Table C-5, the current rate for delivery of petroleum, in dollars per gallon, is nearly three times as much for the Iliamna Lake communities as for the communities on Bristol Bay, 80¢ vs. 30¢.

Table C-5
Estimated Petroleum Movement Cost Savings
Scenario 1

	2020 Forecast Consumption (gal)	1999 Rate ($/gal)	Estimated Rate with Road[1] ($/gal)	2020 Cost Estimate Using 1999 Rates ($ paid)	2020 Cost Estimate Assuming Scenario 1 is Implemented ($ paid)	2020 Savings Achievable ($ saved)
Pedro Bay	49,180	$0.800	$0.120	$39,300	$5,900	$33,400
Iliamna / Newhalen	303,280	$0.800	$0.150	$242,600	$45,500	$197,100
Nondalton	270,490	$0.800	$0.160	$216,400	$43,300	$173,100
Igiugig	73,770	$0.800	$0.200	$59,000	$14,800	$44,200
King Salmon / Naknek	1,139,340	$0.300	$0.270	$341,800	$307,600	$34,200
South Naknek	139,340	$0.300	$0.270	$41,800	$37,600	$4,200
Levelock	139,340	$0.800	$0.230	$111,500	$32,000	$79,500
Aleknagik	229,510	$0.300	$0.300	$68,900	$68,900	$0
Dillingham	2,795,080	$0.300	$0.300	$838,500	$838,500	$0
			TOTALS	**$1,959,800**	**$1,394,100**	**$565,700**

[1] This cost estimate assumes that a tanker truck with a 7,500-gallon capacity is used.

With Scenario 1, the estimated lowest cost route for petroleum would be via barge to Williamsport then via tanker truck over the Cook Inlet to Bristol Bay Road, even though this requires transferring the petroleum from barge to truck at Williamsport. The estimated barging cost to Williamsport would be 10¢ per gallon, compared to 30¢ for a barge trip around the Alaska Peninsula and into Bristol Bay. Added to this would be a trucking cost of 0.09¢ per gallon per mile. Total costs would range from about 12¢ per gallon to Pedro Bay to about 30¢ per gallon to Dillingham. The largest savings would be for the Iliamna Lake communities that currently require shipping via the Kvichak River.

Modest savings, in contrast, are anticipated for the Bristol Bay communities that are served directly by relatively frequent barge service, as part of the larger Bristol Bay market. According to this analysis, the cost of petroleum movement to Naknek is projected to fall only a few cents – from 30¢ to 27¢ per gallon. Dillingham and Aleknagik would have no net savings, as the price via Williamsport would be the same as the current price, 30¢. The Bristol Bay communities, however, would benefit from the barge and road route via Williamsport in that it would be open during winter months when barge shipments to Bristol Bay cannot be made.

Total petroleum freight movement cost savings from building the Cook Inlet to Bristol Bay Roadway System, including a connection to Dillingham, are estimated at $565,700 annually (Table C-5).

"Other" Cargo Movement Cost Savings

Cargo movement savings achievable by implementing Scenario 1 are anticipated in two major areas. The first, and the primary focus of this assessment, is the savings that can be achieved in moving goods and commodities to communities in Southwest Alaska. The second has to do with savings achieved by providing the region's gillnet fishers a more viable route between their fishing grounds in Bristol Bay, and Cook Inlet, where many store their vessels during the off-season, and where many have repair and maintenance done. These impacts are explored separately.

Commodities Movement Impacts

Listed in Table C-6 is a summary of estimated cost savings in commodities movements based on the rate calculations, and port call assumptions earlier discussed. This analysis suggests that about $10.2 million per year could be saved in freight costs in terms of moving "Other" cargo alone, if Scenario 1 is implemented. Note that cargo shipment mode shift under the proposed infrastructure improvements had to be taken into account in this analysis. These mode shift assumptions are documented in Table C-6. These mode shift assumptions, under both existing conditions and under the assumption that Scenario 1 is built, are based on primary source data and area shippers' input. Table C-6 also reflects several changes in air freight rates resulting from the implementation of new roadway connections, specifically, roadway connections linking Nondalton to Iliamna Airport, South Naknek to King Salmon Airport, and Aleknagik to Dillingham Airport. At present air cargo to these three smaller communities is transferred from a larger plane to a smaller plane at the hub airport, flown to the community airport, then delivered to its final destination. With the new roadway connections, air freight can be delivered to these three smaller communities directly from the hub airport, eliminating the need for an additional flight.

Table C-6
Estimated "Other" Cargo Cost Savings
Scenario 1

	Mode Split and Rates Under Existing (1999) Conditions					Mode Split and Rates Assuming Scenario 1 is Implemented				Results		
	Marine	Air	Marine	Air	2020 Freight Volume Estimate	Barge / Road	Air	Barge / Road[1]	Air	Freight Costs Paid in 2020 Assuming No Change	Freight Costs Paid in 2020 Assuming Scenario 1 is Implemented	Savings Possible due to Scenario 1
	%	%	($/lb.)	($/lb.)	(lbs.)	%	%	($/lb.)	($/lb.)	($)	($)	($)
Pedro Bay	60%	40%	0.686	0.640	486,000	85%	15%	0.276	0.640	$324,500	$160,700	$163,800
Iliamna / Newhalen	65%	35%	0.686	0.390	2,997,000	85%	15%	0.283	0.390	$1,745,500	$896,300	$849,200
Nondalton	65%	35%	0.802	0.640	2,673,000	85%	15%	0.283	0.390	$1,992,200	$799,400	$1,192,800
Igiugig	70%	30%	0.686	0.640	729,000	85%	15%	0.297	0.640	$490,000	$254,000	$236,000
King Salmon / Naknek	75%	25%	0.510	0.420	11,259,000	85%	15%	0.286	0.420	$5,488,800	$3,446,400	$2,042,400
South Naknek	75%	25%	0.510	0.670	1,377,000	85%	15%	0.286	0.420	$757,400	$421,500	$335,900
Levelock	75%	25%	0.765	0.640	1,377,000	85%	15%	0.298	0.640	$1,010,400	$481,000	$529,400
Aleknagik	75%	25%	0.655	0.670	2,268,000	85%	15%	0.325	0.420	$1,494,000	$769,400	$724,600
Dillingham	75%	25%	0.510	0.420	27,621,000	85%	15%	0.325	0.420	$13,465,200	$9,370,400	$4,094,800
TOTALS					**50,787,000**					**$26,768,000**	**$16,599,100**	**$10,168,900**

[1] Barge cost to Williamsport plus trucking cost at 0.03¢ per pound per mile.

A few explanations regarding the Iliamna Lake communities are needed to interpret Table C-6. First, a weighted average was used in calculating the marine shipment rate under existing conditions for Iliamna Lake communities. This weighted average takes into account the percentage shipped, and rates paid, for marine freight via Naknek and Williamsport, respectively. In terms of projected rates, this analysis assumes that if the Cook Inlet to Bristol Bay Roadway System is built then most waterborne cargo will be shipped to Iliamna Lake communities via Williamsport.

Gillnet Fleet Transport Impacts

In its 1995 economic assessment, the US Army Corps of Engineers (USCOE) pointed out another area of savings that could be realized if these improvements were made. They point to the many gillnet vessels that each year make the trip from Cook Inlet to the fisheries in Bristol Bay and back. Some vessels are transported because they spend the off-season in Cook Inlet; others make the trip periodically for repairs and maintenance purposes. In all, about 825 gillnet boats are estimated to make the round trip each year.

Of these, the vast majority (about 785) sail around the Alaska Peninsula, a 1,100-mile trip that takes three days, and is estimated to cost $1,800. A small contingent (about 40), however, makes the trip via Williamsport, which is almost a thousand miles shorter and is estimated to cost about $1,233 per vessel. Although this trip is less costly in terms of both time and dollars, it is arduous, risky, and can only be undertaken during narrow time windows. Moreover, many gillnet vessels cannot be transported via this route because they are too wide to pass through existing bridges.

According to the US Army Corps of Engineers' detailed analysis, savings in the neighborhood of $1,082,500 could be achieved on the part of gillnet vessel movement alone if the Williamsport Channel were dredged, and if the existing Williamsport to Pile Bay Road and its bridges were rehabilitated.[37] Accordingly, these estimated savings are added to the freight movement savings estimated earlier.

"Other" Cargo Movement Cost Savings Summary

Total freight movement cost savings under Scenario 1 is estimated at $11,817,100. Of this total, $1,082,500 is attributable to gillnet vessel transport savings. To these savings can be added $565,700 in petroleum movement savings, along with $10,168,900 in "Other" commodity movement savings (Table C-7).

[37] According to the USCOE, the number of gillnet vessels taking the Williamsport route would increase from 40 to 747 round trips per year (*Navigation Channel Feasibility Report and Environmental Assessment, Williamsport*, US Army Corps of Engineers, Alaska District, December 1995).

Table C-7
Scenario 1
Freight Movement Cost Savings Summary

Petroleum	**$565,700**
Gillnet Fleet	**$1,082,500**
Other Cargo	**$10,168,900**
TOTAL	**$11,817,100**

Scenario 2: Implement Williamsport to Pile Bay Improvements

If the Williamsport to Pile Bay Road were rehabilitated, in tandem with navigational improvements at Williamsport, it is estimated that most of the Iliamna Lake-bound cargo now barged up the Kvichak River from Naknek would shift to the Williamsport route. In addition, since marine transport under this scenario would be viable during the ice free season on Iliamna Lake (generally from May to November), rather than only during the season when the Kvichak River is both ice-free and high enough to support shallow draft vessels (generally August to November) it is also assumed that a portion of the cargo now flown into Iliamna Lake communities would be barged, trucked, and then shipped again via Williamsport. Whereas the mode split for Iliamna Lake communities is currently estimated to be from 48% to 56% marine via Naknek, from 12% to 14% marine via Williamsport, and from 30% to 40% by air; with the proposed improvements, cargo volumes are assumed to shift to 10% marine via Naknek; 65% marine via Williamsport; and 25% by air.

It is estimated that these improvements would lower the cost of moving cargo to Iliamna Lake communities (via a surface route) from 37 to 24 cents per pound. When the assumed mode shift and rate values are applied to the cargo forecast volumes for the 2020 design year, savings attributable to the project can be calculated, as shown in Table C-8.

While the rehabilitation of the Williamsport to Pile Bay Road, in tandem with navigational improvements at Williamsport, is estimated to result in changes in the pattern of delivery of "Other" cargo to Iliamna Lake communities, it is not expected that changes in the movement of petroleum would occur. Under this scenario, petroleum would have to be pumped from a barge to a truck at Williamsport, from a truck to a barge at Pile Bay, then again from a barge to a truck for delivery to its final destination, in contrast to Scenario 1 where the tanker truck that receives the petroleum in Williamsport can deliver it directly to its final destination.

Scenario 2 also achieves gillnet fleet transport savings described for Scenario 1. Accordingly, $1,082,500 in gillnet fleet savings can be added to the $2,765,900 figure for "Other" cargo, for total freight movement savings achievable under this scenario estimated at $3,848,400 per year (Table C-9).

Table C-8
Estimated "Other" Cargo Cost Savings
Scenario 2

	2020 Forecast "Other" Cargo (lbs.)	Mode Split, Rates and Costs Under Existing (1999) Conditions				Mode Split, Rates and Costs Under Scenario 2				
		Marine via Naknek	Marine via Wmsport	Air	TOTAL Freight Costs Paid	Marine via Naknek	Marine via Wmsport	Air	TOTAL Freight Costs Paid	Savings Due to Scenario 2
Pedro Bay										
Mode Split	486,000	48%	12%	40%	$324,500	10%	65%	25%	$190,800	**$133,700**
Rate		$0.765	$0.370	$0.640		$0.765	$0.240	$0.640		
Iliamna/Newhalen										
Mode Split	2,997,000	52%	13%	35%	$1,745,500	10%	65%	25%	$989,000	**$756,500**
Rate		$0.765	$0.370	$0.390		$0.765	$0.240	$0.390		
Nondalton										
Mode Split	2,673,000	52%	13%	35%	$1,992,200	10%	65%	25%	$882,100	**$1,110,100**
Rate		$0.910	$0.370	$0.640		$0.765	$0.240	$0.390		
Kokhanok										
Mode Split	2,025,000	52%	13%	35%	$1,356,500	10%	65%	25%	$794,800	**$561,700**
Rate		$0.765	$0.370	$0.640		$0.765	$0.240	$0.640		
Igiugig										
Mode Split	729,000	56%	14%	30%	$490,000	10%	65%	25%	$286,100	**$203,900**
Rate		$0.765	$0.370	$0.640		$0.765	$0.240	$0.640		
TOTALS					**$5,908,700**				**$3,142,800**	**$2,765,900**

Table C-9
Scenario 2
Freight Movement Cost Savings Summary

"Other" Cargo	**$2,765,900**
Gillnet Fleet	**$1,082,500**
TOTAL	**$3,848,400**

Scenario 3: Implement Iliamna–Nondalton and Dillingham–Aleknagik Projects

This scenario examines the freight cost savings achievable with the implementation of the Iliamna–Nondalton and Dillingham–Aleknagik projects by themselves, without other parts of the Cook Inlet to Bristol Bay Roadway System. In the case of the Iliamna–Nondalton project, the savings are due to connecting Nondalton by road to the Iliamna Airport and to barge traffic on Iliamna Lake. In the case of the Dillingham–Aleknagik project, the savings are due to connecting Aleknagik by road to the Dillingham Airport and by accessing more frequent barge service at Dillingham.

All savings that would be realized by implementation of these projects would be in the "Other" cargo category. No petroleum cost savings are assumed. As shown on Table C-10, annual freight savings from the Iliamna–Nondalton project would be $435,400; from the Dillingham–Aleknagik project $388,300.

Table C-10
Estimated "Other" Cargo Cost Savings
Scenario 3

	Mode Split and Rates Under Existing (1999) Conditions					Mode Split and Rates Assuming Scenario 3 is Implemented				Results		
	Marine %	Air %	Marine ($/lb.)	Air ($/lb.)	2020 Freight Volume Estimate (lbs.)	Marine %	Air %	Marine ($/lb.)	Air ($/lb.)	Freight Costs Paid in 2020 Assuming No Change ($)	Freight Costs Paid in 2020 Assuming Scenario 3 is Implemented ($)	Savings Possible due to Scenario 3 ($)
Nondalton	65%	35%	0.802[1]	0.640	2,673,000	65%	35%	0.686[2]	0.390[2]	$1,992,200	$1,556,800	$435,400
Aleknagik	75%	25%	0.655[3]	0.670	2,268,000	75%	25%	0.510[4]	0.420[4]	$1,494,000	$1,105,700	$388,300

[1] Includes cost of offloading from a Lake Iliamna barge and then transporting to Nondalton by smaller vessel.
[2] Includes cost of trucking from Iliamna or Newhalen
[3] Includes cost of offloading from a Bristol Bay barge and then transporting to Aleknagik by smaller vessel.
[4] Includes cost of trucking from Dillingham

Allocation of Freight Savings to Roadway Segments

Scenario 1 describes the freight savings that would accrue to various communities with implementation of the Cook Inlet to Bristol Bay Roadway System, coupled with navigation improvements at Williamsport, while scenario 2 describes the freight savings that would accrue just with the navigational improvements at Williamsport and rehabilitation and widening of the existing road and bridges between Williamsport and Pile Bay. The Scenario 2 examination shows that the Williamsport–Pile Bay improvements by themselves would yield considerable benefits in terms of freight cost savings, on the order of $3,554,600. As described in the Southwest Alaska Transportation Plan, November 2002, and reiterated in the Findings section of this technical memorandum, these benefits exceed the annualized capital cost plus O&M cost of the project. Therefore it is reasonable to assume that the Williamsport–Pile Bay improvements might be implemented even in the absence of extension of the roadway system further west. Thus it is appropriate when comparing the freight savings benefits due to the extension of the roadway to Bristol Bay to use only the incremental savings due to the road system, i.e. the Scenario 1 savings less the Scenario 2 savings. These incremental savings are shown in Table C-11.

Further, freight savings benefits accrue to a particular community only if that community is connected by road all the way to Williamsport. For example, savings for Naknek from shipping freight via road from Williamsport are only realized if all the segments of road between Naknek and Williamsport are in place. Thus the freight savings from implementation of the entire roadway system need to be allocated to individual roadway segments in proportion to the savings accrued to all communities down road, not just the savings that would occur in the next community. The allocation of the freight savings to roadway segments in shown in Table C-12.

Table C-11
Incremental Freight Cost Savings

	"Other" Cargo			Petroleum	
	Savings Attributable to Scenario 1	Savings Attributable to Scenario 2	Net Savings	Savings Attributable to Scenario 1	Total Incremental Savings
Pedro Bay	$163,800	$133,700	$30,100	$33,400	$63,500
Iliamna/Newhalen	$849,200	$756,500	$92,700	$197,100	$289,800
Nondalton	$1,192,800	$1,110,100	$82,700	$173,100	$255,800
Igiugig	$236,000	$203,900	$32,100	$44,200	$76,300
King Salmon/ Naknek	$2,042,400	$0	$2,042,400	$34,200	$2,076,600
South Naknek	$335,900	$0	$335,900	$4,200	$340,100
Levelock	$529,400	$0	$529,400	$79,500	$608,900
Aleknagik	$724,600	$0	$724,600	$0	$724,600
Dillingham	$4,094,800	$0	$4,094,800	$0	$4,094,800
TOTALS	**$10,168,900**	**$2,204,200**	**$7,964,700**	**$565,700**	**$8,530,400**

Table C-12
Allocation of Incremental Freight Savings to Roadway Segments

Segment	Estimated Annual Freight Cost Savings
Pile Bay to Pedro Bay to Iliamna	$2,247,800
Iliamna to Nondalton	$115,800
Iliamna to Igiugig	$1,974,700
Igiugig to Naknek	$599,100
Naknek to South Naknek	$83,900
Jct. w/ Igiugig Road to Levelock	$1,343,400
Levelock to Aleknagik	$1,170,900
Aleknagik to Dillingham	$994,800
	$8,530,400